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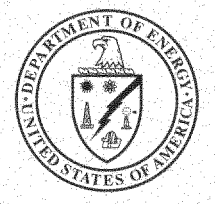

U.S. Department of Energy
Idaho Operations Office

Monitoring System and Installation Plan for Operable Unit 3-13, Group 5, Snake River Plain Aquifer

Idaho National Engineering and Environmental Laboratory

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Revision 2

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Prepared for the
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ABSTRACT

This Monitoring System and Installation Plan provides the general strategy for accomplishing the Operable Unit 3-13, Group 5, Snake River Plain Aquifer remedial action. This work plan presents the design basis and data quality objectives that were developed based upon an evaluation of remedial action requirements set forth in the Operable Unit 3-13 Record of Decision. Summaries of the primary remedial action design elements are discussed, including the Plume Evaluation Field Sampling Plan and the Long-Term Monitoring Plan. The Field Sampling Plan was developed to determine if contingent pump and treat remediation of the Snake River Plain Aquifer is necessary. The Long-Term Monitoring Plan was developed for long-term monitoring of the Idaho Nuclear Technology and Engineering Center groundwater plume outside of the Idaho Nuclear Technology and Engineering Center fence and to monitor the flux of contamination in the Snake River Plain Aquifer migrating from beneath Idaho Nuclear Technology and Engineering Center. This work plan also references or presents the supporting documentation required for performing the remedial action, including the project health and safety plan, waste management plan, project schedule and cost estimate, data management plan, quality assurance project plan, and various other documents required for implementation of the Group 5 remedial action.

CONTENTS

FIGURES

TABLES

ACRONYMS

AA	alternative action
AIR	allowable incremental risk
ARAR	applicable or relevant and appropriate requirement
ART	allowable risk threshold
BBWI	Bechtel BWXT Idaho, LLC
BLM	Bureau of Land Management (Department of Interior)
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CIR	CERCLA Incremental Risk
COC	contaminant of concern
CPP	Chemical Processing Plant
DOE	Department of Energy
DOE-ID	Department of Energy Idaho Operations Office
DQO	data quality objective
DR	decision rule
DS	decision statement
EPA	Environmental Protection Agency
ER	environmental restoration
FFA/CO	Federal Facility Agreement and Consent Order
FS	feasibility study
FSP	Field Sampling Plan
FSS	feasibility study supplement
GSA	General Services Administration
HASP	Health and Safety Plan
HLW	high-level waste

HLWIR	High Level Waste Incremental Risk
ICDF	INEEL CERCLA Disposal Facility
ICPP	Idaho Chemical Processing Plant
IDHW	Idaho Department of Health and Welfare
INEEL	Idaho National Engineering and Environmental Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
LTMP	long-term monitoring plan
MCL	maximum contaminant level
MCP	management control procedure
MSIP	Monitoring System and Installation Plan
NPDES	National Pollutant Discharge Elimination System
NRF	Naval Reactor Facility
NSIR	New Site Incremental Risk
OU	operable unit
PSQ	principal study question
QAPjP	Quality Assurance Project Plan
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RD/RA	remedial design/remedial action
RFP	Request for Proposal
RG	remediation goal
RI/BRA	remedial investigation/baseline risk assessment
RI/FS	remedial investigation/feasibility study
ROD	Record of Decision
ShoBan	Shoshone Bannock (Tribal Council)
SMO	Sample Management Office

SOW	Scope of Work
SRPA	Snake River Plain Aquifer
TRL	total risk level
WAG	waste area group

Monitoring System and Installation Plan for Operable Unit 3-13, Group 5, Snake River Plain Aquifer

1. INTRODUCTION

In accordance with the Idaho National Engineering and Environmental Laboratory (INEEL) Federal Facility Agreement and Consent Order (FFA/CO) (DOE-ID 1991), the Department of Energy (DOE) submits the following Monitoring System and Installation Plan (MSIP) for the remediation of the Idaho Nuclear Technology and Engineering Center (INTEC), Waste Area Group (WAG) 3, Operable Unit (OU) 3-13, Group 5, Snake River Plain Aquifer (SRPA). The Remedial Design/Remedial Action (RD/RA) Scope of Work (SOW) (DOE-ID 2000a) for Group 5, is in accordance with the signed OU 3-13 Record of Decision (ROD) (DOE-ID 1999) and describes the RD/RA process, and identifies the tasks for the Group 5 remedy under the ROD.

The RD consists of a series of engineering documents that detail the steps to be taken during the RA in order to meet the remedial action objectives established in the ROD; its goal is the successful planning of the RA phase of the project. The RA phase includes the elements, systems, and actions necessary for successful implementation of the remedy.

1.1 Background

The INTEC, formerly known as the Idaho Chemical Processing Plant (ICPP), is located in the south-central area of the INEEL in southeastern Idaho (Figure 1-1). From 1952 until 1992, operations at the INTEC primarily involved reprocessing spent nuclear fuel from defense projects. This entailed extracting reusable uranium from spent fuel. Liquid waste generated from the reprocessing activities that ceased in 1992 is stored in an underground tank farm at the INTEC. This waste was previously treated using a calcining process at the facility. Both soil and groundwater contamination has resulted from these operations. Under the FFA/CO, the U.S. Environmental Protection Agency (EPA), the Idaho Department of Health and Welfare (IDHW), and the DOE (also referred to as the Agencies) are directing cleanup activities to reduce human health and environmental risks to acceptable levels. Per the FFA/CO, the INTEC was designated as WAG 3. In order to facilitate remediation of the INTEC, WAG 3 was further divided into OUs comprised of individual contaminant release sites.

Several phases of investigation have been performed at the OUs within WAG 3. A comprehensive remedial investigation/baseline risk assessment (RI/BRA) (DOE-ID 1997a) was conducted for OU 3-13 to determine the nature and extent of contamination and corresponding potential risk to human health and the environment under various exposure pathways and scenarios. Based on the remedial investigation/feasibility study (RI/FS) results, INTEC release sites were further segregated into seven groups based on contaminants of concern (COCs), accessibility, or geographic proximity to allow analysis of remedial action alternatives in the WAG 3 Feasibility Study (FS) (DOE-ID 1997b and 1998). The contaminated portion of the SRPA outside the INTEC security fence where COC concentrations in groundwater exceed drinking water standards was designated as Group 5 in the OU 3-13 ROD.

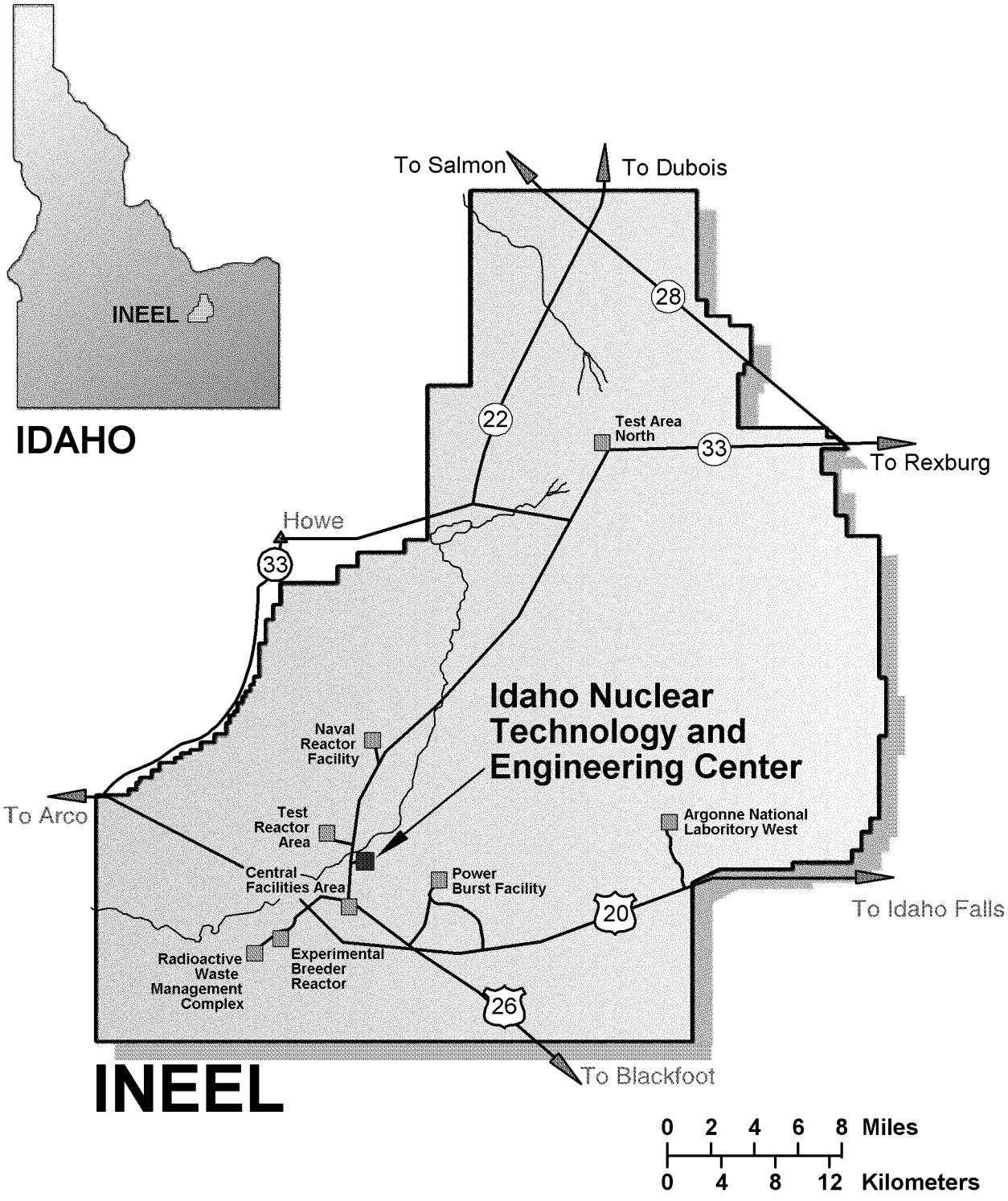

Figure 1-1. Map showing location of the INTEC at INEEL.

The major human health threat posed by contaminated SRPA groundwater is exposure to radionuclides via ingestion by future groundwater users. Based on the groundwater simulations presented in the FS (DOE-ID 1997b) and FS Supplement (FSS) (DOE-ID 1998), removal of the existing percolation ponds from service will significantly reduce the concentrations of contaminants in SRPA groundwater by 2095. Additional RA may be necessary to meet the groundwater maximum contaminant levels (MCLs) for beta particle and photon-emitting radionuclides. RA for the SRPA is bounded by the contaminant plume that exceeds Idaho groundwater quality standards or the federal MCLs for tritium (H-3), strontium-90 (Sr-90), and iodine-129 (I-129). Maps of the H-3, Sr-90, and I-129 plumes are presented in Figures 1-2 through 1-4, respectively.

1.2 Selected Remedy

An interim action is selected for the SRPA as described in the OU 3-13 ROD. While the remediation of contaminated SRPA groundwater outside the INTEC security fence is final, the final remedy for the contaminated portion of the SRPA inside the INTEC security fence is deferred to the tank farm RI/FS investigation, which has been designated as OU 3-14. Because the SRPA groundwater contaminant plume associated with INTEC operations is divided into two zones, the remedial action described herein is classified as an interim action. The selected interim action remedy for the SRPA is Institutional Controls with Monitoring and Contingent Remediation. The SRPA interim action remedy includes the following:

1. Implement institutional controls over the area of the aquifer that exceeds the MCLs for H-3, Sr-90, and I-129 (to include a DOE-ID directive limiting access) to prevent groundwater use while INTEC operations continue and to restrict future groundwater use (through noticing this restriction to local county governments, Shoshone Bannock [ShoBan] Tribal Council, General Services Administration [GSA], Bureau of Land Management [BLM], etc.), including site access restrictions, drilling restrictions, and maintenance during DOE operations at INTEC.

   Implementation: This remedy is being implemented through institutional controls identified and described in the OU 3-13 RD/RA SOW.

2. Implement institutional controls, including land use restrictions to prevent the use of SRPA groundwater over the area of the aquifer that exceeds the MCLs for H-3, Sr-90, and I-129, until drinking water standards are met, which is projected to occur by 2095.

   Implementation: This remedy is being implemented through institutional controls identified and described in the OU 3-13 RD/RA SOW.

3. Establish SRPA monitoring wells outside of the current INTEC security fence to assess whether MCLs will be exceeded after 2095.

   Implementation: This remedy is being implemented through this MSIP and associated work plans. This MSIP details the deepening of four existing SRPA monitoring wells and installation of one new well to sample both the sediments and groundwater of the SRPA above, below, and within the HI (HI is nomenclature for the interbed between the H and I basalt beds as discussed in Anderson and Lewis [1991]) sedimentary interbed in the vicinity of the WAG 3 RI/FS numerical-model-predicted hot spot (that is, the location of highest COC concentrations). It also details groundwater monitoring of existing wells to support the assessment of whether MCLs will be exceeded after 2095. Data collected through these activities will be analyzed to predict whether MCLs will be exceeded after 2095.

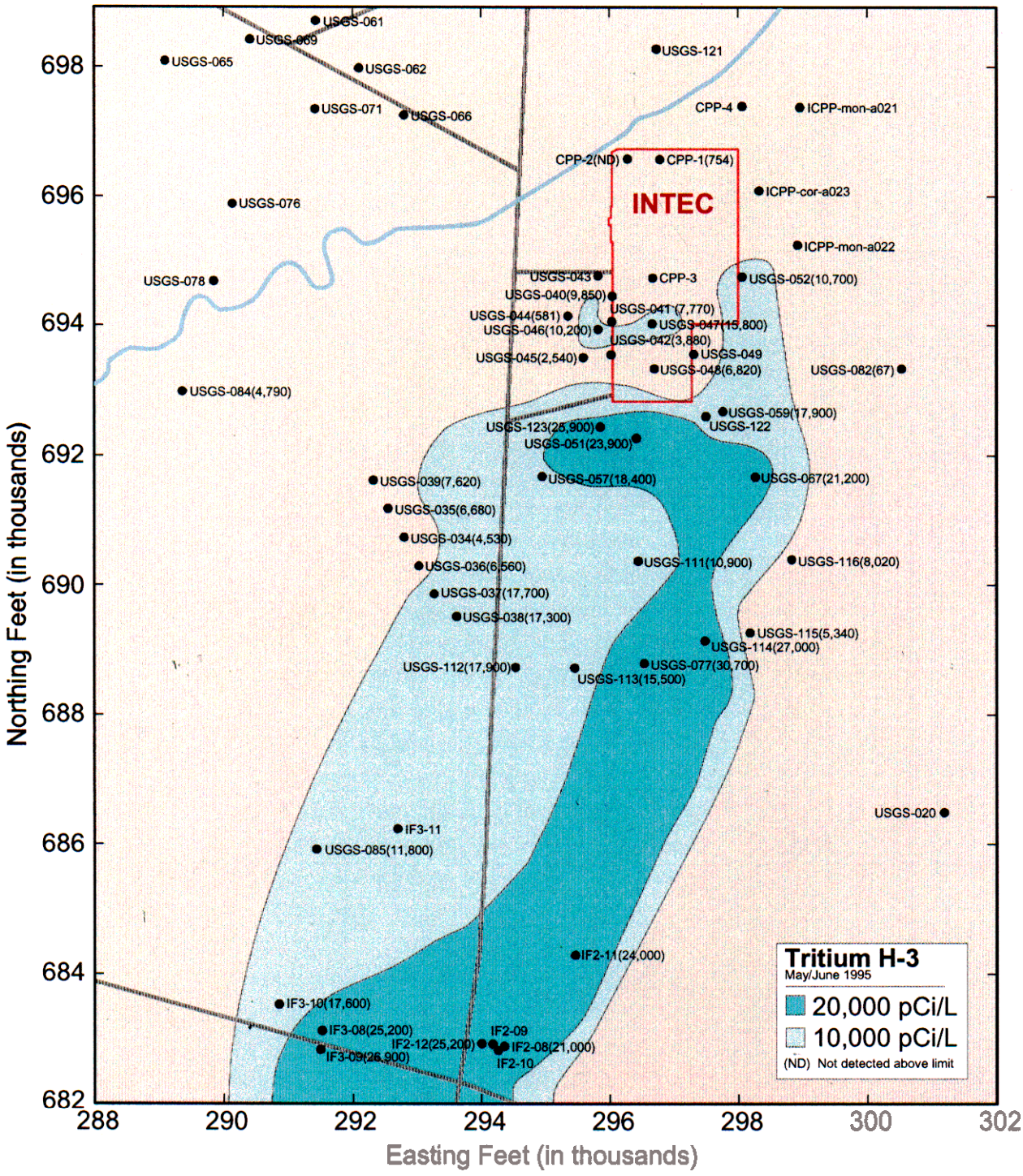

Figure 1-2. Contaminant plume showing where tritium (H-3) has been found to exceed standards (May/June 1995).

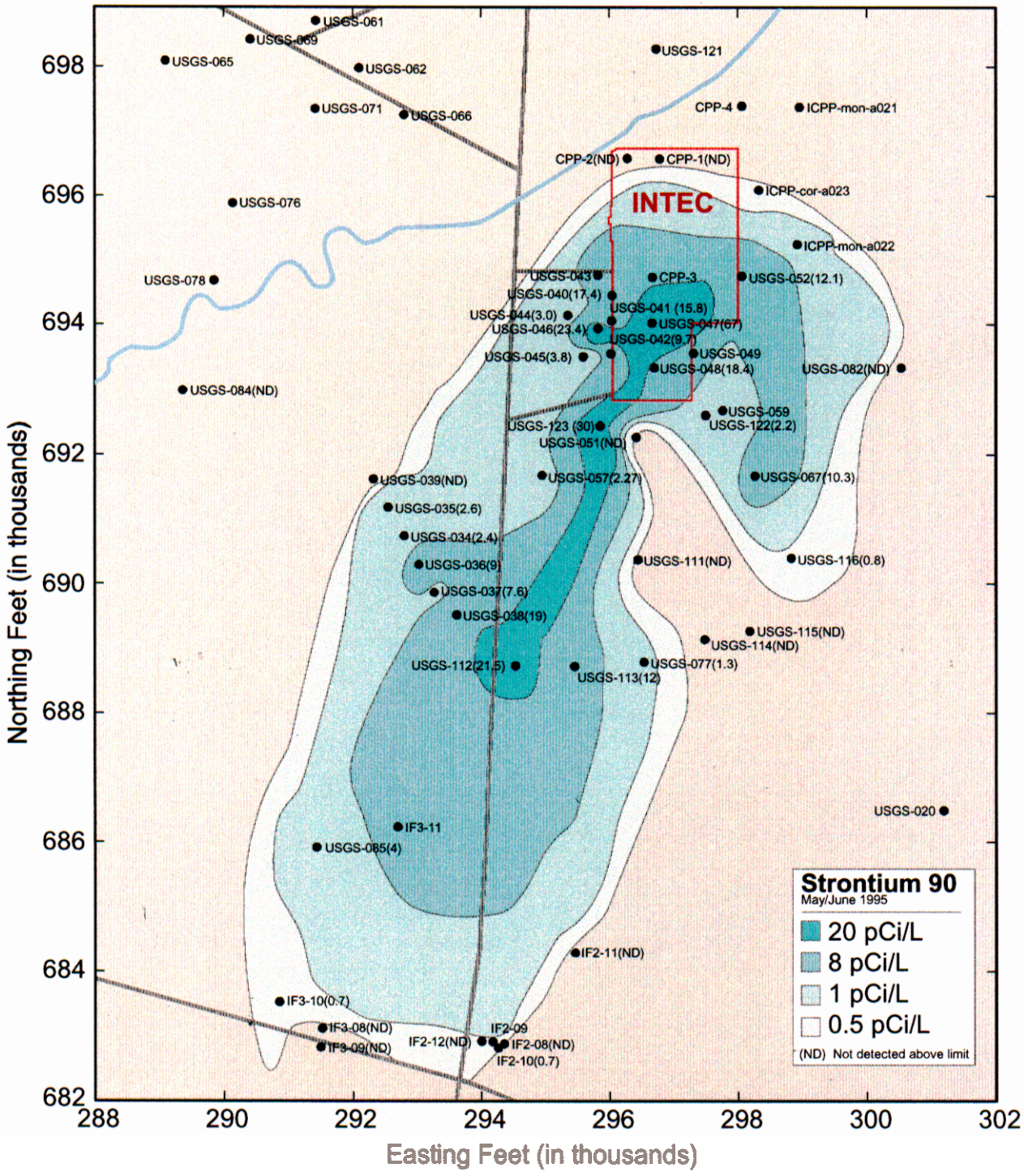

Figure 1-3. Contaminant plume showing where strontium-90 (Sr-90) has been found to exceed standards (May/June 1995).

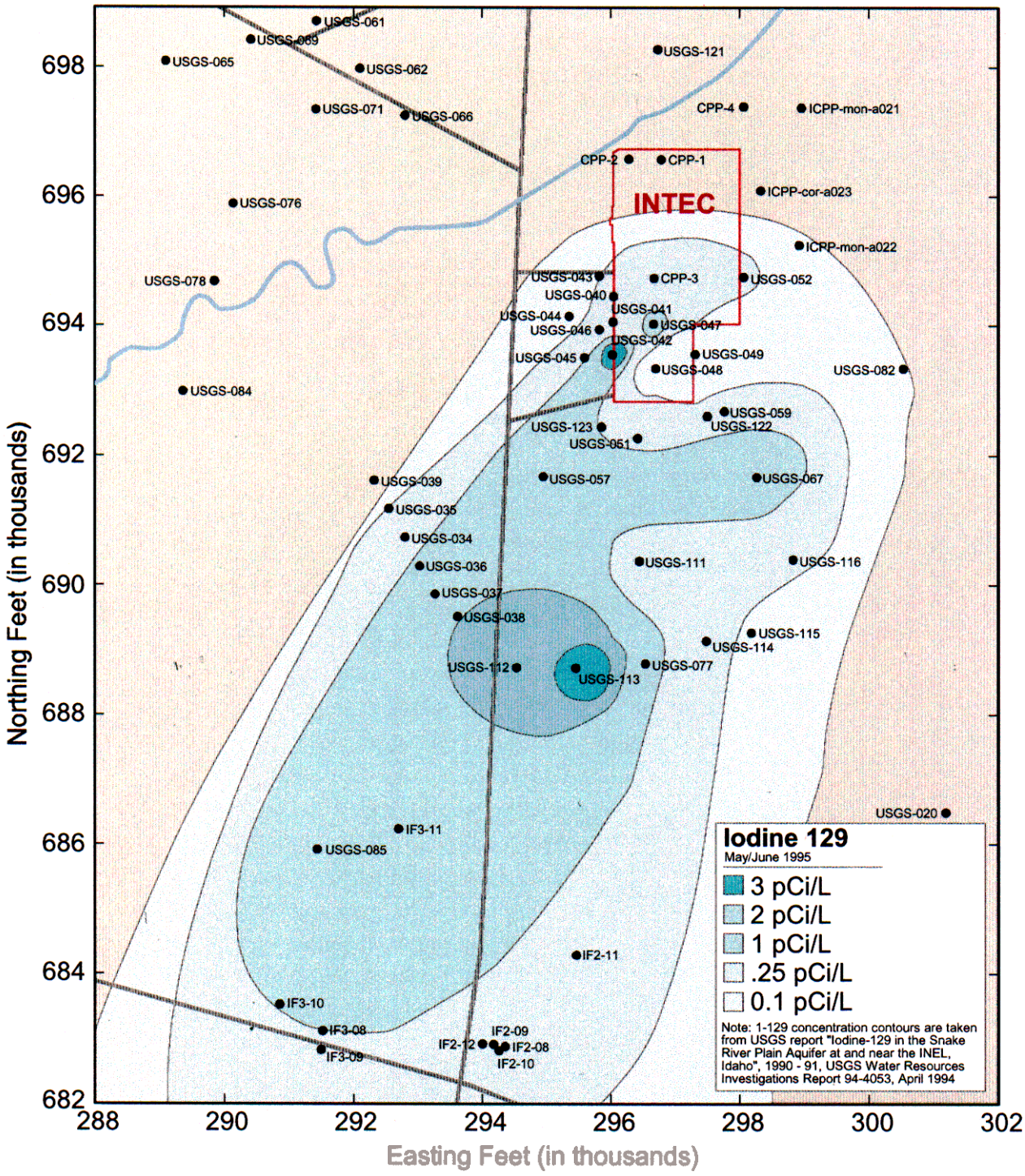

Figure 1-4. Contaminant plume showing where iodine-129 (I-129) has been found to exceed standards (from USGS 1990/1991 data).

4. If observed COC concentrations exceed their action levels at a sustained pumping rate of at least 0.5 gpm for 24 hours, implement pump and treatment RA. Extract contaminated SRPA groundwater from the zone(s) exceeding COC action levels and treat to reduce the contaminant concentrations to meet MCLs by 2095. The action level is the model-predicted maximum concentration that could be present in the year 2000 so that the MCL will not be exceeded in 2095 (the planned end of the institutional control period).

   Implementation: Implementation of this remedy is contingent upon the decision obtained under step 3, above. If it is decided that MCLs will not be exceeded in 2095, the contingent pump and treatment RA and associated tasks will not be implemented. If it is decided that MCLs will be exceeded in 2095, additional work planning will be conducted to support this RA (see Appendix H).

5. Standard pump and chemical/physical treatment (which may include evaporation in the INEEL CERCLA Disposal Facility [ICDF] Complex surface impoundment) are anticipated to be able to meet the aquifer restoration goal. Conduct treatability studies, which include a technical evaluation of treating the I-129 and other COCs, as part of this remedy. These studies may include evaluation of the ability to treat and selectively withdraw contaminants from the aquifer. These studies have been estimated to not extend more than 12 months and to be limited to a total cost of $2 million.

   Implementation: Implementation of this remedy is contingent upon the decision obtained under step 3, above. If it is decided that MCLs will not be exceeded in 2095, the contingent pump and treatment RA and these associated tasks will not be implemented. If it is decided that MCLs will be exceeded in 2095, additional work planning will be conducted to support this RA (see Appendix H).

6. If the treatability studies indicate the presence of sufficient quantities of I-129 and other COCs, and contaminated groundwater can be selectively extracted and cost-effectively treated to meet the drinking water MCLs outside the INTEC security fence by 2095, then implement active remediation.

   Implementation: Implementation of this remedy is contingent upon the decision obtained under step 3, above. If it is decided that MCLs will not be exceeded in 2095, the contingent pump and treatment RA and these associated tasks will not be implemented. If it is decided that MCLs will be exceeded in 2095, additional work planning will be conducted to support this RA.

7. Either return treated water to the aquifer through land recharge in accordance with the Idaho Wastewater Land Application Permit applicable or relevant and appropriate requirements (ARARs) if a recharge impoundment is used or in accordance with National Pollutant Discharge Elimination System (NPDES)/State Pollutant Discharge Elimination System ARARs if the treated effluent is discharged to the Big Lost River, which recharges the aquifer downstream of the INTEC facility; or evaporate in the ICDF Complex evaporation pond or equivalent.

   Implementation: Implementation of this remedy is contingent upon the decision obtained under step 3, above. If the decision is reached that MCLs will not be exceeded in 2095, the contingent pump and treatment RA and these associated tasks will not be implemented. If it is decided that MCLs will be exceeded in 2095, additional work planning will be conducted to support this RA.

1.3 Scope

The OU 3-13 ROD requires remediation of the SRPA if assessment of the WAG 3 RI/FS model-predicted contaminant hot spot and contaminant concentration trends indicates the concentrations of the Group 5 COCs will exceed MCLs in 2095 and beyond. This work plan and associated documents present the SOW required to evaluate whether contingent RAs are necessary for OU 3-13, Group 5, SRPA.

Two primary activities will be implemented under this MSIP. The first activity is an evaluation of the model-predicted hot spot to check model accuracy and update groundwater model predictions for COC concentrations in 2095 and beyond. The collection of data to support this task is described in detail in Appendix A, the Plume Evaluation Field Sampling Plan (FSP), as well as in Sections 4 and 5 of this report. The second activity comprises (a) groundwater monitoring to evaluate flux of COCs to Group 5 from Group 4 (the INTEC perched water and vadose zone) and the SRPA beneath the INTEC (inside the security fence) and (b) groundwater monitoring of the INTEC plume outside the INTEC fence. The collection of data to support this groundwater COC trend monitoring is discussed in detail in Appendix B, Long-Term Monitoring Plan (LTMP), as well as in Sections 4 and 5 of this report. A brief description of these two activities is provided below.

1.3.1 Plume Evaluation FSP Scope

The basic objective of the Plume Evaluation FSP scope is to evaluate whether the OU 3-13 RI/FS groundwater modeling is accurate in predicting that a hot spot of primarily I-129 exists south of INTEC in the vicinity of wells USGS-111 and USGS-113 that is of sufficient magnitude to exceed MCLs in 2095 and beyond. This will involve installing four new wells and/or boreholes in the vicinities of the RI/FS modeled I-129-hot spot and the MSIP modeled I-129-hot spot to evaluate the occurrence and magnitude of the hot spot. This data will be analyzed to generate a volumetric estimate of the hot spot where concentrations are predicted to exceed MCLs in 2095 and beyond. If a hot spot is not found, this would be an indication that the OU 3-13 RI/FS groundwater modeling predications are not correct and the model would need to be updated to reflect this finding.

1.3.2 Long-Term Monitoring Plan Scope

The basic objectives of the long-term monitoring actions are to evaluate the contamination in the INTEC groundwater plume outside of the INTEC fence and to evaluate the flux of contaminants into the SRPA outside of the INTEC security fence line (Group 5) from contamination that is currently in the vadose zone and aquifer beneath the footprint of the INTEC facility. These data will be evaluated over time to determine if the flux of COCs into Group 5 will result in exceeding MCLs in 2095 and beyond. This will be accomplished through the long-term periodic sampling and analysis of aquifer monitoring wells in the vicinity of INTEC to track COC concentration trends through the institutional control period.

The wells currently selected for long-term monitoring may be changed based on the results of the baseline sampling and the 5-year review. If additional wells are needed to monitor the SRPA, the LTMP will be revised and a sufficient number of monitoring locations will be chosen to track the groundwater contamination. In addition, the number of wells to be sampled may be expanded every 5 years to allow for evaluation and modifications to the monitoring network.

During the semiannual groundwater sampling event, groundwater samples will be collected using both the high flow (15 – 25 gpm) pumps currently in the wells and using a micropurge method that pumps at approximately 1 gpm at 20 wells. The data from both methods will be evaluated to determine if they

are statistically equivalent and compared to historical data trends. Statistical equivalency will be determined by doing a student t-test on the data.

If the micropurge data are determined to be equivalent to the standard sampling data, future groundwater samples will be collected by this method. Adopting the micropurge method will substantially reduce the amount of wastewater generated during sampling and significantly reduce the costs associated with the monitoring program.

1.3.3 Other Projects Implementing Remedy Scope

Other RA elements related to Group 5 are being addressed as projects separate from the SOW of this project. The specific tasks and the projects where they are being handled are as follows:

- Implementation of institutional controls—This work scope is intended to prevent use of perched water while INTEC operations continue and to prevent future drilling into or through the perched zone. This project is being addressed as a part of the Group 8 Institutional Controls Plan.

- Implementation of remedies to control surface water recharge—This work scope is intended to mitigate flux of COCs to the SRPA and Group 5 from the perched water beneath INTEC (inside the security fence), specifically by taking the existing INTEC percolation ponds out of service. The design, construction, and operation of replacement ponds outside the INTEC perched water area following the removal from service of the existing INTEC percolation ponds are being addressed by the OU 3-13 Service Waste Water Discharge Facility project.

1.3.4 Composite Analysis Scope

The WAG 3 RI/FS model did not account for any contaminant sources except soil contamination at Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) sites. It does not include sources such as the heels that will be left in the tank farm tanks or facility closures. Further the Draft environmental impact statement (EIS) groundwater model includes only high-level waste sources. It does include what is left in the tank heels but not the contaminated soils around the tanks. The EIS sources and the CERCLA OU 3-13 and OU 3-14 sources all need to be added together to capture all the known sources. Future model runs will consider all sources and the relocation of the percolation ponds.

As part of the CERCLA cumulative risk evaluation, the composite analysis of risks via the groundwater pathway from all sources at INTEC will be updated. As new sites are identified, additional information is obtained about existing sites, and various sites are removed or capped, the WAG 3 aquifer model will be updated to account for the change in source terms.

1.4 RD/RA Work Plan Organization

This MSIP was prepared following the methodology outlined in the *Remedial Design and Remedial Action Guidance for the Idaho National Engineering Laboratory* (DOE-ID 1993) and the requirements outlined in the *Guidance on Expediting Remedial Design and Remedial Action* (EPA 1990). The information developed and presented in this MSIP builds on the decisions made and documented in DOE-ID 2000a and DOE-ID 1999.

The organization of the remainder of this MSIP is as follows:

- Section 2. Design Criteria—Provides a description of the project and the design requirements and provisions
- Section 3. Design Basis—Provides a status of the OU 3-13 ROD assumptions, a discussion of the modeling of the SRPA hot spot, and an evaluation of how the project ARARs will be met
- Section 4. Remedial Design—Provides a discussion of the Plume Evaluation FSP and the LTMP design elements
- Section 5. Remedial Action Work Plan—Provides an overview of the remedial action elements, any changes to the RD/RA SOW, an evaluation of performance measures, and a summation of the key guidance documents
- Section 6. Reporting—These reports and reviews include CERCLA 5-year reviews and the assessment of the RA performance
- Section 7. References—Key documents that will be used to guide and direct the execution of the project tasks.